ETHER CARBOXYLATE DETERGENT BUILDERS AND PROCESS FOR THEIR PREPARATION

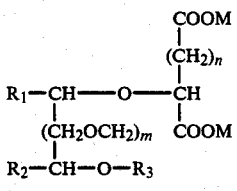
BACKGROUND OF THE INVENTION

The present invention relates to ether carboxylate-containing compositions and to a process for making them. These ether carboxylate materials are effective sequestering agents and are useful as builders in detergent compositions for household, institutional and industrial use.

The role of sequestering agents in softening water by complexing the "hardness" cations in water supplies is well-known. Sequestering agents are recognized aids in detergent processes because they form a soluble complex with calcium and magnesium ions which can react with soaps and other anionic surfactants and otherwise adversely affect detergency. Polyphosphates such as tripolyphosphates and pyrophosphates are widely used as ingredients in detergent compositions in part because of their property of sequestering hardness ions. Such phosphorus-containing compounds as well as nitrogen-containing compounds, e.g., nitrilotriacetates, are highly effective. However, the effect of the phosphorus content and the nitrogen content of these sequestering agents upon eutrophication of lakes and streams has been questioned, and the use of phosphates in detergent compositions has been subject to government scrutiny, regulation or prohibition.

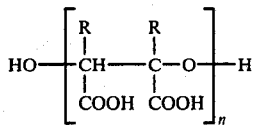
These circumstances have developed a need for highly effective and efficient phosphorus-free and nitrogen-free sequestering agents and detergency builders. A variety of phosphorus-free and nitrogen-free builder materials have, in fact, been prepared in the form of polycarboxylate compounds. Especially preferred polycarboxylate builders from the standpoint of hardness sequestering capacity and builder performance are the ether polycarboxylates.

A number of types of ether polycarboxylates are known in the art and, along with methods for their preparation, have been disclosed in the patent literature. For example, Stubbs et al; U.S. Pat. No. 4,017,541; Issued Apr. 12, 1977 disclose dicarboxyalkyl ethers of the formula:



wherein R_1 is H,—CH_3 or —COOM; R_2 is H or COOM; R_3 is H,—CH_2COOM or —$CH(COOM)(CH_2)_n$(-COOM), n is 0 or 1, m is 0, 1 or 2 or M is H,—CH_3, —C_2H_5 or alkali metal. Preferred compounds of this type are said to include propylene glycol monosuccinyl ether and propylene glycol disuccinyl ether.

Pearson et al; U.S. Pat. No. 3,776,850; Issued Dec. 4, 1973 disclose polymeric polycarboxylate builder compounds of the formula:



wherein R can be hydrogen and n ranges from 2 to 4. Builder compositions of this type usually contain a mixture of polymers having structures within this general formula.

Berg; U.S. Pat. No. 3,128,287; Issued Apr. 7, 1964 and Lamberti et al; U.S. Pat. No. 3,635,830; Issued Jan. 18, 1972 both disclose oxydisuccinic acid and salts thereof. The '830 patent discloses the use of this oxydisuccinic acid material as a detergent builder.

The disclosed methods for preparing the ether carboxylates of the foregoing patents in general involve the alkaline earth metal catalyzed reaction of carboxylic reactants such as maleic anhydride, maleic acid, and their derivatives. For example, oxydisuccinate builder materials as disclosed in the aforementioned U.S. Pat. Nos. 3,128,287 and 3,635,830 are prepared by heating maleic anhydride or maleic acid in the presence of a molar excess of calcium hydroxide, followed by acid treatment of the resulting reaction product. Such processes employing these particular reactants, however, have especially slow reaction kinetics and furthermore result in relatively low conversions of starting material to the desired ether carboxylate reaction product. These processing disadvantages render such materials as oxydisuccinate less attractive for use as builders in detergent products to be commercially marketed in large volume.

Therefore, notwithstanding the existence of the foregoing types of ether carboxylate detergent builders and ether carboxylate preparation processes, there remains a continuing need to identify additional non-phosphorus, non-nitrogen sequestering agents such as ether carboxylates which can be prepared via commercially acceptable synthesis processes and which can be employed in commercially useful and practical detergent compositions. Accordingly, it is an object of the present invention to provide novel ether carboxylate builder compositions and components thereof, which compositions and components can serve as especially effective builder materials in both granular and liquid detergent and laundry additive compositions.

It is a further object of the present invention to provide a process for preparing ether carboxylate materials of this type via an efficient, high yield reaction which utilizes simple, commercially available reactants.

It is a further object of the present invention to provide detergent compositions and laundry additive compositions employing such novel ether carboxylate compounds as sequestering builders.

SUMMARY OF THE INVENTION

In its composition aspects, the present invention relates to ether carboxylate detergent builder compositions comprising from about 1% to 99% by weight of a tartrate monosuccinic acid, or a salt thereof, and from about 1% to 99% by weight of a tartrate disuccinic acid, or salt thereof. Separate claims to each of these novel builder composition components are also presented. Likewise claims are also presented to detergent compositions and laundry additive compositions con-